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experimental support. Likewise for the theory of heterogenesis as capable of explaining species formation as a whole, the author finds an "extreme meagerness in quantity of the real scientific evidence." He declares that no indubitable cases of species-forming or transforming have been observed.

"The theories of orthogenesis of the general type exemplified by Eimer's are directly in line with the spirit of modern biological methods and investigations. They rest on the assumption that physico-chemical factors produce direct effects on the plastic organism, and that such effects . . . modify or control evolution." Any tendency, such as is shown by Nägeli, to substitute a "mystic vital force" for the "physico-chemical factors" receives the author's severe censure; yet except as one emphasizes the complex and unknown internal factors rather than the simpler conditions of environment, these conceptions are not far apart. "Nägeli believes that animals and plants would have developed about as they have, even had no struggle for existence taken place, and the climatic and geologic conditions been quite different from what they actually have been." Much more could be said in favor of orthogenesis than Professor Kellogg records.

In the concluding chapter it is stated that "Darwinism, then, as the natural selection of the fit, the final arbiter in descent-control, stands unscathed, clear and high above the obscuring cloud of battle. . . . To my mind every theory of heterogenesis, of orthogenesis, or of modification by the transmission of acquired characters confesses itself ultimately subordinate to the natural selection theory." Yet before closing, Professor Kellogg returns to a discussion of orthogenesis as "a determinate though not purposeful change."

After each chapter there is an appendix containing considerable citations from works on evolution. The volume should prove valuable to students; we hope that they will not lay it aside with the author's remark "*Kurz und gut*, we are immensely unsettled."

F. T. L.

The Effect of Environment upon Animals.—It is well known that if the pupæ of certain butterflies, *e. g.*, Vanessa or Pyrameis, be subjected to extreme cold (0° to -20° C.) many of the adults will be aberrant in color pattern. However, if they be subjected to extreme heat (42° to 46° C.) the same aberrations

will be produced. Less extreme heat (35° to 37° C.) gives aberrations differing from these. Opinions do not agree as to the reason why extreme heat and extreme cold produce the same results. M. von Linden considers it to be a "pathological" phenomenon caused by tissue injury. Narcotizing and whirling on a centrifugal machine cause similar effects. Fischer¹ argues with great force that this is not so. He believes it to be a "normal" arrest of development, such as occurs during hibernation, pointing out, however, the difficulty of drawing a sharp line between normal and pathological physiology. Both *Vanessa* and *Pyrameis* are common in America. It would be well worth while to study critically the inheritance of these abnormalities.

Salamandra maculosa is normally either viviparous or oviparous, producing a large number (up to 72), young. These young, when born, are larvæ. They live in water for some time, finally losing their gills and metamorphosing into land salamanders. If, however, the female be deprived of water, she will give birth to a small number (2 to 7) of young which have already lost their gills. Kammerer² carried the experiment still farther and found that, even if the abnormally born females be given water, they give birth to young having reduced gills.

Plate³ has made a detailed study of the genus *Cerion* (land snails) of the Bahama Islands. Many local races or varieties were found. He believes these to be due to the modifying influence of the environment, but gives no experimental evidence. Snails could easily be transplanted from one island to another in order to test this point. The Bahama Islands are so near to America that this problem should appeal especially to American students of evolution.

FRANK E. LUTZ.

¹ Fischer, E. Zur Physiologie der Aberrationen- und Varietäten-Bildung der Schmetterlinge. *Archiv für Rassen- und Gesellschafts-Biologie*, IV, 6, November-December, 1907.

² Kammerer, Paul. Die Nachkommen der spätgeborenen *Salamandra maculosa* und der frühgeborenen *Salamandra atra*. *Archiv für Entwicklungsmechanik der Organismen*, XXV, 1 and 2, December, 1907.

³ Plate, C. Die Variabilität und die Artbildung nach dem Prinzip geographischer Formenketten bei den *Cerion*-Landschnecken der Bahama-Inseln. *Archiv für Rassen- und Gesellschafts-Biologie*, IV, 4 and 5, July-October, 1907.